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Research Paper

Experience with Ponseti treatment and Achilles tenotomy in the treatment of clubfoot at Federal Medical Center, Owerri - A Preliminary Report

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Abstract
Background
Idiopathic clubfoot is the commonest musculoskeletal congenital anomaly. The aim of its treatment is to achieve a functional painless, plantigrade and flexible foot. In the Ponseti method, strict adherence to the recommendations on manipulation techniques, proper casting and sequential deformity correction is important with achilles tenotomy being an integral part of the treatment phase when indicated.
Aims: *To assess the effectiveness of the Ponseti method in treatment of clubfoot and the rate of achilles tenotomy using this method.*
Method: *A prospective study of children who met the inclusion criteria. The Pirani score was assessed at each visit and weekly serial manipulation and casting was done using the Ponseti protocol. Achilles tenotomy was done when indicated. Data analyzed for reliability of Ponseti method and frequency of achilles tenotomy.*
Results: *40 children (58 feet) were enrolled with mean age of 23.38weeks. There was a male preponderance and 45% bilateral involvement. Ponseti method reliably corrected all foot deformities with a tenotomy rate of 65% with feet with higher contracture score requiring tenotomy . An average of 5 casts was used to correction.*
Conclusion: *Ponseti method reliably corrects CTEV deformities and Achilles tenotomy is required in majority of cases of CTEV*

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I. INTRODUCTION

The congenital clubfoot is a complex three-dimensional deformity having four components:ankle equines, hind foot varus, midfoot varus and forefoot adduction[1].
The aim of idiopathic clubfoot treatment is to achieve a functional, painless, plantigrade and flexible foot.[2]Guidelines for the Ponseti method of nonoperative treatment were developed by Dr Ignacio Ponseti in 1948. It involves weekly gentle stretching and manipulation followed by application of a well-moulded long-leg plaster cast with the knee held at 90-110 degrees.[3]
In Ponseti method, strict adherence to the recommendations on manipulation techniques, proper casting and sequential deformity correction is important.
One of the integral key elements of the Ponseti method for the treatment of idiopathic clubfoot is the percutaneous Achilles tenotomy.[4]
Tenotomy is indicated when dorsiflexion of at least 15^0 cannot be obtained at the clinical examination to prevent rocker bottom deformity.[5] After the tenotomy the foot is placed in a final cast in an over-corrected position of maximal abduction and dorsiflexion.
Achilles tenotomy is required in about 80 % of patients with idiopathic congenial clubfoot.[6]

II. OBJECTIVES

To assess the effectiveness of the Ponseti method in treatment of clubfoot and also the rate of Achilles tenotomy using this method.

III. METHOD

This prospective study was carried out over a 16 month period at the clubfoot clinic of Federal University Teaching Hospital(FUTHO), Owerri formerly known as Federal Medical Center Owerri is a major tertiary institution in the heart of Owerri, the capital city of Imo state in south eastern Nigeria.

All children less than 24 months with unilateral or bilateral clubfeet without previous surgical intervention that presented to clubfoot clinic during the period of the study were included while premature babies and children with syndromic or acquired clubfoot were excluded.

All new cases were seen and assessed (history and physical examination) and diagnosis made.

Consent to be enrolled into the study was obtained from the parents/ guardians

Standard Ponseti method for club foot treatment was used.

End point of treatment was when the foot is ready for bracing i.e when the forefoot can be maximally abducted with a thigh-foot axis of 60^0 and the ankle can be dorsiflexed to 15^0

Percutaneous tenotomy was performed if ankle dorsiflexion was less than 15^0

IV. RESULTS

A total of 40 children (58 feet) were assessed sonographically and clinically by Pirani scoring system. They included 22 males and 18 females with a male to female ratio of 1.22:1. (table 2; figure1)

The mean age of all children was 23.38weeks (±22.32). Mean age of age brackets are represented on table 1

In this study, 22 (55%) patients had unilateral involvement and 18 (45%) had bilateral involvement. Of the unilateral cases, right sided clubfoot was slightly commoner (12 patients) than the left sided clubfoot (10 patients).

The mean pre-treatment Midfoot Contracture Score (MFCS) and mean post treatment Midfoot Contracture Score (MFCSp) was 2.15 (±0.70) and 0.01 (±0.07); which were found to be significant with the p-value<0.001.

The mean pre treatment Hindfoot Contracture Score (HFCS) and mean post treatment Hindfoot Contracture Score (HFCSp) was 1.84 (±0.81) and 0.18 (±0.24) which were found to be significant with the p-value<0.001.

The mean pre-treatment and post treatment total Pirani score was 3.98 (±0.42) and 0.19 (±0.24) respectively and were found to be significant with the p-value<0.001.

Results for clinical variables-pre-treatment and post-treatment have been grouped in Table 3.

A total of 38 (65.5%) out of 58 feet had percutanous Achilles tenotomy before application of last cast.

An average of 5 casts was used to achieve correction of deformity.

Table 1: Statistical summary of age of children

Age	Valid N	**Mean ±SD**	**Minimum**	**Maximum**
0 to 26 weeks	23	8.61±6.38	1	20
27 to 52 weeks	12	32.33±6.38	27	44
> 52 weeks	5	69.80±18.24	53	91
All patients	40	23.38±22.32	1	91

Table 2: Gender distribution of children

Gender	Male (percent)	Female (percent)
0 to 26 weeks	13 (56.5)	10 (43.5)
27 to 52 weeks	7 (58.3)	5 (41.7)
> 52 weeks	2 (40.0)	3 (60.0)
Total	22 (55.0)	18 (45.0)

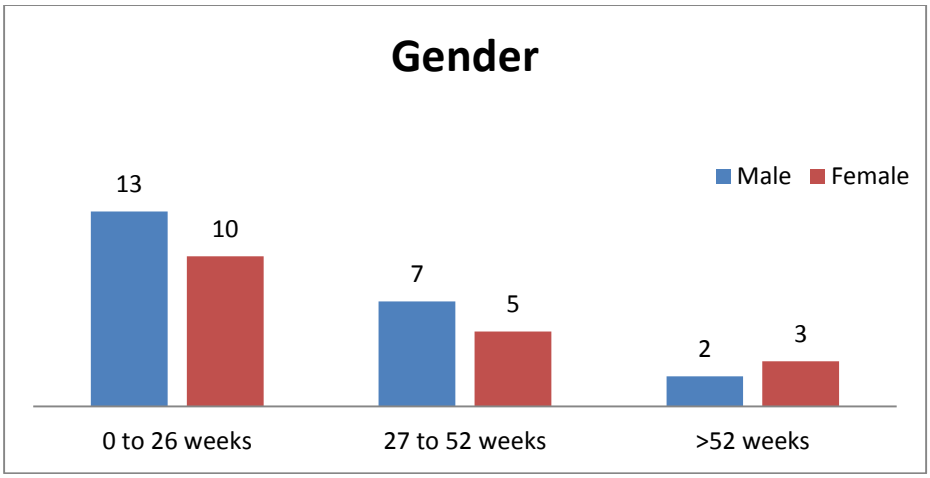

Figure 1: Gender distribution of children by age bracket

Table 3: Statistical summary of pre-treatment and post treatment means of clinical parameters

Clinical Parameter	Pre-procedure Mean±SD	Post-procedure Mean±SD	T test	p value
TPS	3.98±1.42	0.19±0.24	21.28	< 0.001*
MFCS	2.15±0.70	0.01±0.07	20.88	< 0.001*
HFCS	1.84±0.81	0.18±0.24	16.67	< 0.001*

Table 4: Statistical summary; tenotomy

	Frequency	Percent	Valid percent	Cumulative percent
YES	38	65.5	65.5	65.5
NO	20	34.5	34.5	100
All Foot	58	100	100	

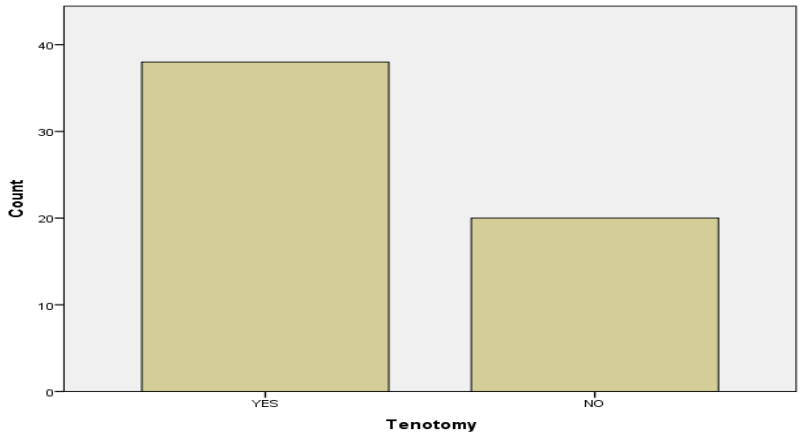

Figure 2; Distribution of tenotomy

Table 5: Group Statistics for tenotomy and contracture scores

	Tenotomy	N	Mean	Std. Deviation	Std. Error Mean
MFCS	YES	38	2.38	.67	.11
	NO	20	1.70	.55	.12
HFCS	YES	38	2.13	.70	.11
	NO	20	1.28	.72	.16

Table 6: Ranks for tenotomy and hindfoot score

	Tenotomy	N	Mean Rank	Sum of Ranks
HFCS	YES	38	35.55	1351.00
	NO	20	18.00	360.00
	Total	58		

Test Statistics

	HFCS
Mann-Whitney U	150.000
Wilcoxon W	360.000
Z	-3.834
Asymp. Sig. (2-tailed)	.000
Exact Sig. (2-tailed)	.000
Exact Sig. (1-tailed)	.000
Point Probability	.000

Table 7; Ranks for tenotomy and midfoot score

	Tenotomy	N	Mean Rank	Sum of Ranks
MFCS	YES	38	35.01	1330.50
	N0	20	19.03	380.50
	Total	58		

Test Statistics

	MFCS
Mann-Whitney U	170.500
Wilcoxon W	380.500
Z	-3.531
Asymp. Sig. (2-tailed)	.000
Exact Sig. (2-tailed)	.000
Exact Sig. (1-tailed)	.000
Point Probability	.000

V. DISCUSSION

Percutaneous Achilles tenotomy has been widely described as an integral part of clubfoottreatment using the Ponseti method2. In this study, the pre-treatment and post treatment Pirani scores, the Ponseti method reliably corrected all foot deformities with children's mean MFCS and MFCSp were 2.15±0.70 and 0.01±0.07; mean HFCS and HFCSp were 1.84±0.81, and 0.18±0.24 while mean pre-treatment and post treatment Pirani score was 3.98±1.42 and 0.19±0.24 respectively (Table 3) Improvement in the Pirani scores was significant as analysed by bivariate T-test with a p value of < 0.001. This finding is in tandem with findings by Khaled et al.[7] Similarly, Chawla et al[8] reported significant mean difference in the midfoot and hindfoot scores in their study.

A significant improvement of the clinical scores following treatment with the Ponseti method lays credence to its efficacy in correction of the deformities associated with CTEV.

Numerous other publications in the last several years have demonstrated the success of CTEV correction based on the Ponseti method.1,[9,10]

This study reported a tenotomy rate of 65.5%which was similar to that by Khaled et al at 64%7while some studies have reported as high as 80%6,[11,12] and a few had a low rate of less than 50%[13].

At presentation, the mean MFCS 2.38±0.67and HFCS 2.13±0.70 were comparable to that by Khaled et al7with a similar tenotomy rate. However Chawla et al had a higher mean mid and hind foot scores(2.41 and 2.65 respectively) and also showed a higher tenotomy rate of 83%. Thus the severity of initial deformity could be attributed to the need for tenotomy as part of treatment.

Additionally, the mean MFCS and HFCS(Table 5) were higher in the feet which later had percutaneous Achilles tenotomy as part of their treatment with the former showing a much higher mean. A strong relationship was established between the mid and hindfoot contracture scores and percutaneous Achilles tenotomy,(Tables 6 and 7) implying that the higher the scores at presentation, the morelikely it is that the foot would require tenotomy to achieve correction.

VI. Conclusion:

Ponseti method is a reliable method for correction of CTEV deformities and Achilles tenotomy is required in majority of cases. The rate of Achilles tenotomy can be

predicted using the initial pirani foot contracture scores at presentation. A high Pirani scoreat presentationmaybe associated with a likelihood of Achilles tenotomy for adequate deformity correction.

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